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TRANSLATION

LIGHT COUNTS OF KILOMETERS

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Just image, you have to measure a distance of 100 m with an accuracy of up to one centimeter. And if with the same accuracy you would be asked to measure one kilometer or even 10 km. It is difficult. But the problem can be solved rapidly and very simply. We will be aided in this respect by the new measuring instrument ZCD-1- and electro-optical range finder. It was developed at the Central Scientific Research Inst of Geodesy, aerial photography and cartography and is already now in series manufacture. The instrument measures greater distances with striking accuracy. And so for example, determining a length of 25-30 km it errs by not more than 3-4 cm.

By its mode of operation the instrument is altogether not similar to conventional range finders - it rather resembles a radar set. The basic difference here lies in the fact that instead of radio waves the range finder uses a beam of light. With the aid of an optical system the beam is focused on that point of the locality, the distance to which has to be measured. Here is first set up a reflector, a kind of a mirror. It consists of 133 miniature "fragments" with an individual lens placed in front of each. This system traps the light beam and reflects it back to the instrument. All this represents a child's play with solar light spots. With the one exception, that not even one, even the smartest youngster, can strike the target with the light spot, a target situated at a distance of several tens of kilometers, and by using a complex honeycombed reflector, such an accuracy can be derived quite simply.

And so, having made the trip to the reflector and back, the light beam has again fallen into the instrument. But how can one find what distance it has covered?

It is known that the speed of light is 300000 km/sec. And since we know with what

speed light travels all we have to do is figure out how much time the journey has consumed. These data will enable us to calculate to what the covered path equals. But not one even most perfect chronometer can read time with a degree of accuracy needed by us. Such a problem is relatively easily solved by radio electronic devices.

In the transmitting part of the range finder is situated an electronic oscillator which periodically, at strictly defined frequency, changes the brightness of the emitted light. Having returned from its short trip the light falls into the receiving part of the instrument and is immediately trapped by a photo element. It transforms the changing in brightness light spot into an alternating electric current. From then on begin purely radiotechnical operations - the alternating currents of transmitter and receiver are compared, by the results is figured out the number of oscillations, which succeeded in realizing the current at the time, when the beam "ran" to the reflector and back. This number, like the number of oscillations of a pendulum in ordinary clocks, given an accurate time reading.

We told about the operation of an electro-optical range finder but only in most general outlines. In fact the entire operation is much more difficult and at the same time much simpler. Difficult because, in the instrument must be carried out a series of precision additional functions, particularly, the frequency of the oscillator-pendulum must be changed smoothly, it must be rigidly stabilized, to carry out measurements on two different frequencies, amplify the weak reflected light signal. And the simplicity lies in the fact, that in the process of measuring, the operator handling the instrument, needs not make any difficult calculations or cumbersome computations - all this is done by precision electronic instruments. The entire process of reading distance takes not more than 10-12 minutes.

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